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## Three Species of Ascaridoid Nematodes from Crocodile in the Philippines

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**Abstract** Three species of ascaridoid nematodes, *Terranova crocodili* (TAYLOR, 1924), *Brevimulticaecum australiensis* (BAYLIS, 1931) and *Dujardinascaris philippinensis* sp. nov., are reported from a crocodile, *Crocodylus porosus*, in the Philippines. The former two species are recorded for the first time from the Philippines. *Dujardinascaris philippinensis* is characterized by having four pairs of postcloacal papillae on a relatively long tail and a spicule the length of which corresponds to 23 to 46% of the body length.

Three species of ascaridoid nematodes, *Terranova crocodili* (TAYLOR, 1924), *Brevimulticaecum australiensis* (BAYLIS, 1931) and *Dujardinascaris philippinensis* sp. nov., were obtained from the stomach of crocodile, *Crocodylus porosus*, from Palawan Island in the Philippines. Until now, four species of trematodes have been described by TUBANGUI and MASILUÑGAN (1936) from *Crocodylus porosus* in the Philippines, but nematodes infecting crocodiles have not been known from the Philippines.

Nematodes in the present study were obtained through the gastric lavage (crocodile #168, 184, 204 & 207) or postmortem examination (#195) of wild crocodiles. The sites of capture and the other information on the crocodiles are shown in Table 1 and Fig. 1 (REGONIEL *et al.*, 1990). Most nematodes were preserved in 5% formalin and cleared in Gater's solution for study. Some nematodes were dehydrated by

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Table 1. Wild crocodiles from Palawan Island examined for nematodes.

Tag No.	Site of capture	Sex	Total length	Body weight	Date of nematodes collected
# 168	Bagusay Riv., Bataraza	F	1 380 m	7.10 kg	17- XI -1989
# 184	Panitian Riv., Quezon	F	1 875	19.50	14- IV -1990
# 195	Ramos Is.	M	1 700	12.20	14- VI -1990
# 204	Karunutan Riv., Balabac Is.	F	2 472	47.50	20- VII -1990
# 207	Taratac Riv., Rio Tuba	M	5 360	578.00	13- VIII -1990

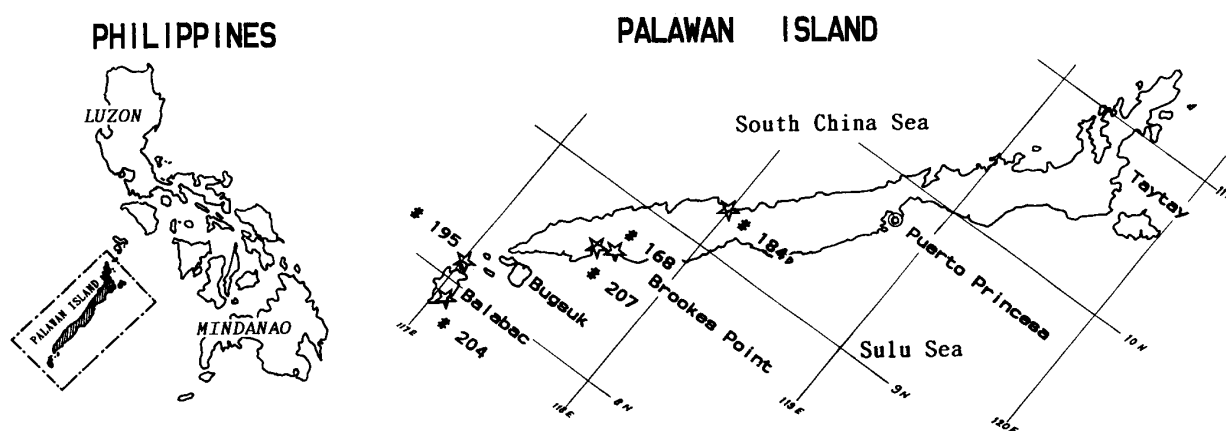


Fig. 1. Map of Palawan Island showing sites of capture of wild crocodiles.

serial ethanol, critical point dried, coated with gold and examined in a SEM (JEOL-T 220). The specimens are deposited in the National Science Museum, Tokyo (NSMT) and the Crocodile Farming Institute, Puerto Princesa.

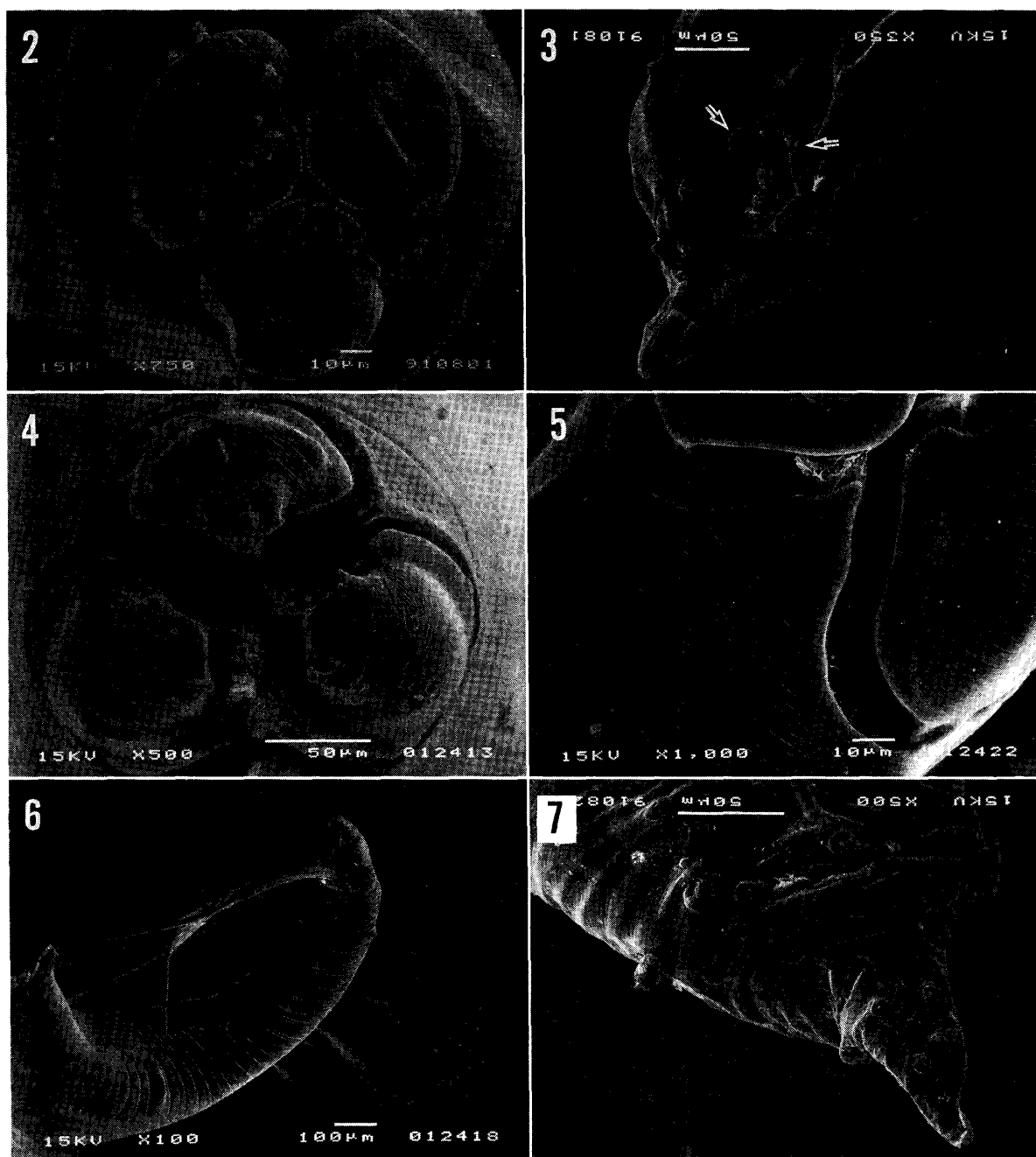
#### Family Anisakidae

#### *Terranova crocodili* (TAYLOR, 1924)

(Figs. 2, 3 & 8)

**Material examined.** Two mature males and one immature female from *Crocodylus porosus* #168 (NSMT-As 2236), five mature males and two immature females from #195 (2237), one mature male and one mature female from #204 (2238), and one mature female from #207 (2239).

**Description.** Male. Based on eight specimens. Body 16.5–23.4 mm long by 0.57–0.83 mm wide. Dorsal lip with two transversely elongated papillae, and subventral lips with a papilla ventrally and an amphid dorsally in each. Each lip having anterior rostrum demarcated by a median groove. The rostrum with denticles on the anterior edge. Esophagus 2.48–3.65 mm long, 12–22% of body length. Nerve ring situated 0.43–0.63 mm from head end. Ventriculus 0.62–0.86 mm long. Intestinal caecum 1.38–2.85 mm long. Spicules 0.69–0.96 mm long, 3–6% of body length. Guber-



Figs. 2-7. SEM micrographs of *Terranova crocodili* and *Brevimulticaecum australiensis*. — 2. Lips of *Terranova crocodili*. 3. Tail of male *T. crocodili*, showing a pair of papillae on anterolateral edge of cloaca (arrows). 4. Lips of *Brevimulticaecum australiensis*. 5. Interlabium of *B. australiensis*, showing inconspicuous striations. 6 & 7. Tail of male *B. australiensis*.

naecum 0.08–0.11 mm long. Caudal papillae pairing up in two lines, one on each ventrolateral side of the body and their number 31–35 in each line, posterior three or four pairs being postcloacal. Six pairs of caudal papillae near and behind cloaca

consist of one pair of single papillae and one pair of double papillae on the anterolateral and lateral edge of cloaca, respectively, three pairs of papillae on a triangle halfway between cloaca and tail end, and one pair of posteriormost papillae. A pair of phasmids lateral, directly anterior to the posteriormost papillae. Three semi-circular cuticular plates with denticles conspicuous behind cloaca. Tail 0.19–0.24 mm long.

Female. Based on two specimens. Body 35.6–54.2 mm long by 1.1 mm wide. Esophagus 4.10–4.45 mm long, 8–12% of body length. Nerve ring 0.65–0.67 mm from head end. Ventriculus 1.20–1.38 mm long. Intestinal caecum 3.35–3.65 mm long. Vulva situated 14.7–23.6 mm from head end, 41–44% of body length. Uterine eggs nearly spherical, 34–39  $\mu$ m in diameter. Tail 0.28–0.31 mm long.

Three additional immature specimens without eggs are 25.3–29.0 mm in length, and the vulva is located at 48–57% of the body length from the head end.

*Remarks.* This species has been reported from crocodiles including *Crocodylus porosus* in Ghana, Australia and Malaya (TAYLOR, 1924; BAYLIS, 1931, 1933; SPRENT, 1979). Our specimens agreed well with the descriptions by TAYLOR (1924) and SPRENT (1979). In the male, a pair of single papillae and a pair of double papillae were observed in our specimens on the anterolateral and lateral edges of cloaca, respectively, which were described as the same level of cloaca by TAYLOR (1924). The former two single papillae were omitted in the description and illustration by SPRENT (1979).

***Brevimulticaecum australiensis* (BAYLIS, 1931)**

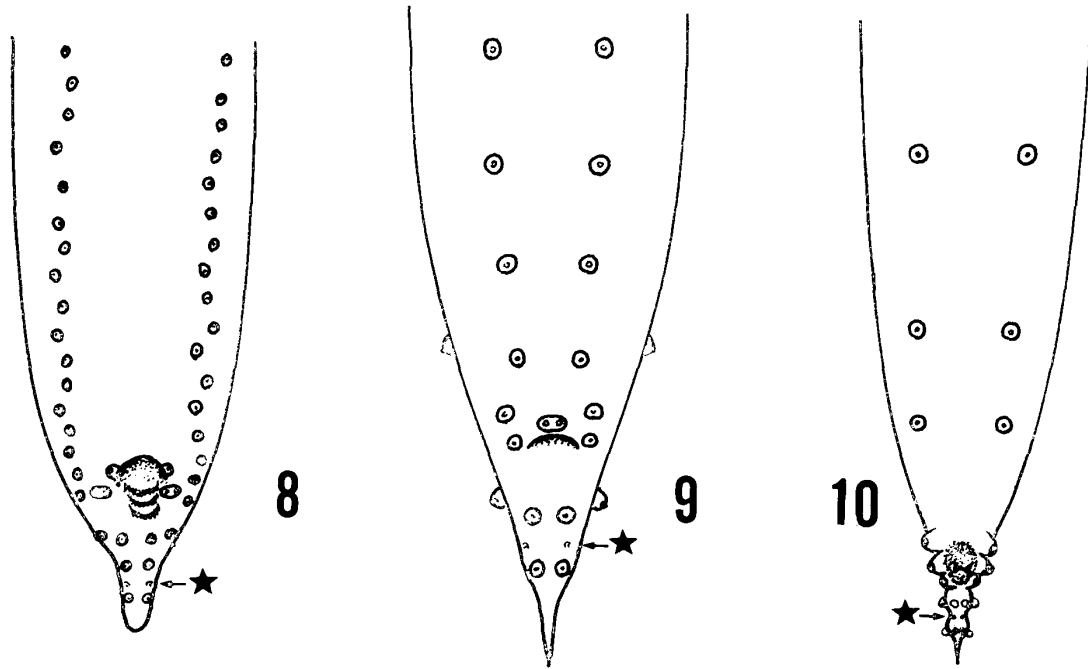
(Figs. 4–7, 9 & 11)

*Material examined.* Fifteen mature males from *Crocodylus porosus* #168 (NSMT-As 2240) and ten mature females from #195 (2241).

*Description.* Male. Based on 15 specimens. Body 14.9–25.0 mm long by 0.30–0.73 mm wide. Esophagus 2.58–4.65 mm long, 16–22% of body length. Nerve ring and excretory pore 0.41–0.67 mm and 0.37–0.56 mm from head end, respectively. Ventriculus 0.10–0.18 mm long. Intestinal caecum 1.72–3.60 mm long. Spicules 1.19–1.74 mm long, 5–10% of body length. Gubernaculum 0.19–0.24 mm long. On each side, four subventral and one lateral precloacal papillae, two subventral paracloacal papillae and two subventral and one subdorsal postcloacal papillae. One central double papilla on the anterior edge of cloaca. A pair of phasmids lateral, directly anterior to the posteriormost papillae. Tail 0.20–0.28 mm long.

Female. Based on 10 specimens. Body 27.7–32.4 mm long by 0.75–0.95 mm wide. Esophagus 4.40–5.15 mm long, 14–18% of body length. Nerve ring and excretory pore 0.53–0.67 mm and 0.45–0.55 mm from head end, respectively. Ventriculus 0.15–0.22 mm long. Intestinal caecum 3.40–4.37 mm long. Vulva 11.1–13.3 mm from head end, 38–42% of body length. Uterine eggs nearly spherical, 59–67  $\mu$ m in diameter. Tail 0.32–0.56 mm long.

*Remarks.* SPRENT (1978, 1990) included two species from crocodiles in the



Figs. 8-10. Schematic arrangement of caudal papillae of males. — 8. *Terranova crocodili*. 9. *Brevimulticaecum australiensis*. 10. *Dujardinascaris philippinensis*. Asterisks indicate phasmids.

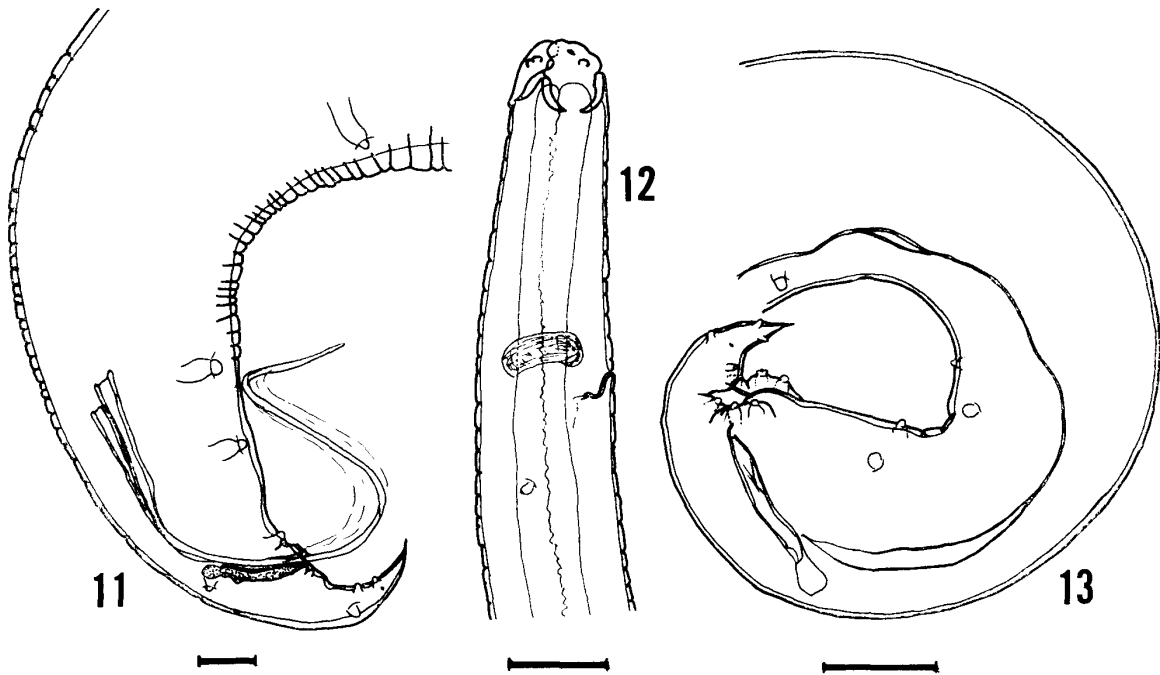


Fig. 11. Tail of male *Brevimulticaecum australiensis*.  
 Fig. 12. Head of *Dujardinascaris philippinensis*.  
 Fig. 13. Tail of male *D. philippinensis*. Scales: 0.1 mm.

genus *Brevimulticaecum*: *B. vandenbrandeni* (BAYLIS, 1929) from *Crocodylus niloticus* and *C. cataphractus* in Africa, and *B. australiensis* (BAYLIS, 1931) from *C. johnstoni* and *C. porosus* in northern Australia and the Solomon Islands. The two species closely resembled each other, but minor differences between them were the more prominently striated interlabia in *B. vandenbrandeni* and the narrower and more prominent rostrum on each lip and the more clearly lobed ventriculus in *B. australiensis* (BAYLIS, 1931; SPRENT, 1978, 1990). It is questionable whether these morphological features are valid for differentiating between two species. Studies on the additional collections of these nematodes from various localities may solve this problem.

*Dujardinascaris philippinensis* sp. nov.

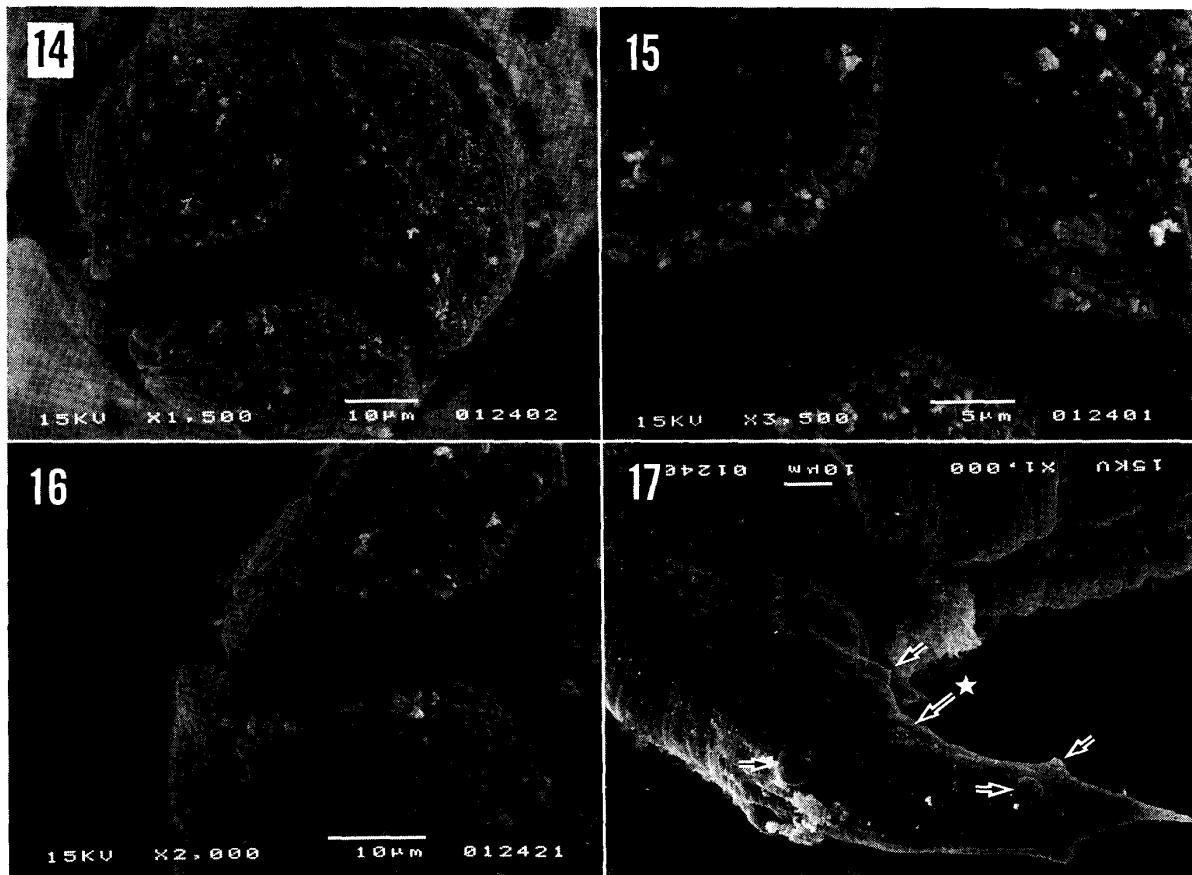
(Figs. 10 & 12–17)

*Material examined.* Five mature males and two immature females from *Crocodylus porosus* #168 (NSMT-As 2242).

*Description.* Male. Based on five specimens. Body 7.5–11.8 mm long by 0.25–0.41 mm wide. Each lip having anterior small rostrum with denticles on the anterior edge. Dorsal lip with a convex process on each lateral side, and subventral lips with a concave process on the dorsal side and a coupler-like process on the ventral side of each lip. The two adjacent processes were combined just like handshaking. Esophagus 1.50–2.04 mm long, 17–20% of body length. Nerve ring and cervical papillae 0.29–0.36 mm and 0.44–0.56 mm from head end, respectively. Excretory pore usually just posterior to nerve ring or occasionally just anterior to it, 0.33–0.42 mm from head end; excretory duct slightly winding. Ventriculus 0.07–0.10 mm long. Intestinal caecum 0.14–1.62 mm long. Cloacal opening in a hollow. Spicules 2.66–3.40 mm long, 23–46% of body length. Gubernaculum 0.19–0.23 mm long, with a little expansion on proximal end and tapering and slightly curved on distal end. On each side, three subventral precloacal papillae, three paracloacal papillae and four (two subventral, one subdorsal and one lateral) postcloacal papillae. A pair of phasmids lateral, each between two subventral postcloacal papillae. Tail 0.20–0.33 mm long.

Female. Based on two immature specimens. Body 10.9–17.1 mm long by 0.35–0.63 mm wide. Esophagus 1.96–2.72 mm long, 16–18% of body length. Nerve ring, cervical papillae and excretory pore 0.46–0.62 mm, 0.59–0.95 mm and 0.45–0.67 mm from head end, respectively. Ventriculus 0.12–0.16 mm long. Intestinal caecum 1.44–1.90 mm long. Vulva 5.36–7.15 mm from head end, 42–49% of body length. Tail 0.23–0.33 mm long.

*Remarks.* Three species of *Dujardinascaris* have been described by BAYLIS (1923) and SPRENT (1977) from Indo-Australian crocodiles: *D. woodlandi* (BAYLIS, 1923) from *Gavialis gangeticus* in India; *D. mawsonae* SPRENT, 1977 from the genus *Crocodylus* including *C. porosus* in Papua New Guinea and Australia; and *D. taylorae* SPRENT, 1977 from *Crocodylus porosus* and *C. novaeguineae* from Australia and Papua



Figs. 14–17. SEM micrographs of *Dujardinascaris philippinensis*. — 14. Lips. 15. Anterior border of lips. 16. Subventral lips, showing concave and convex processes. 17. Tail of male, showing four postcloacal papillae (arrows) and a phasmid (asterisk) on right side.

#### New Guinea.

According to SPRENT (1977), the males of these species had short tails and three pairs of postcloacal papillae. Further, the male of *D. woodlandi*, 24 to 25 mm long, had spicules the length of which was 5% of the body length. Male *D. mawsonae* and *D. taylorae* were 3.2 to 8.6 mm and 7.8 to 14.5 mm long, with spicules of 66 to 92% and 47 to 65% of the body length, respectively. In the present new species, the male was 7.5 to 11.8 mm long, having four pairs of postcloacal papillae on a relatively long tail. The length of spicules corresponded to 23 to 46% of that of the body. The shape of the gubernaculum resembled that of *D. mawsonae*, but the proximal end did not so expand as the latter.

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